

retroreflective elements and microbeads to a substrate to which the ink is to be applied, and a coupling agent for coupling the microbeads and cross-linking the binder chemicals, the coupling agent being unreactive and uncured until the printing process a curing step is carried out during which the temperature of the substrate and ink applied to the substrate is elevated to between 60 and 200 °C, the coupling agent having a storage life of not less than about 3 months and being unreactive except at elevated temperature of the curing step, the coupling agent being selected from the group consisting of an aminoalkyl silanetriol and a blocked polyisocyanate.

58. (cancelled)

59. (previously presented): The combination of claim 57 wherein at least some of the microbeads are without the retroreflective elements.

60. (previously presented): The combination of claim 57 wherein the binder chemical and the coupling agent are selected from the group consisting of:

a polyvinylidene chloride copolymer is the binder chemical and (3-aminopropyl) silanetriol and/or blocked 1,6 hexamethylene diisocyanate trimer is the coupling agent,

an acrylic copolymer is the binder chemical and (3-aminopropyl) silanetriol and/or blocked 1,6 hexamethylene diisocyanate trimer is the coupling agent, and

a polyurethane is the binder chemical and blocked 1,6 hexamethylene diisocyanate trimer is the coupling agent.

61. (previously presented): The combination of claim 57 further comprising one or more components selected from the group consisting of:

pigment, humectant, urea, urea and 2,3 propane diol, buffer, ammonium or sodium phosphates buffer, dispersant, defoamer, thickening agent, cross-linking agent, softening agent, carbon black, UV absorbing material, anti-scuffing agent, a silicone or fluoropolymer, light spill-suppressing agent, anti-static agent, water repellant agent, a silicone, and a fluoropolymer.

62. (previously presented): The combination of claim 57 wherein the volume ratio of the binder to the microbeads is equal to or less than 50%.

63. (previously presented): The combination of claim 57 wherein essentially all of the microbeads are unmetallised and the retroreflective elements include reflective flake particles.

64. (previously presented): The combination of claim 57 wherein the binder forms at least part of a liquid carrier medium for the retroreflective elements or microbeads.

65. (previously presented): The combination of claim 57 wherein the binder chemicals, retroreflective elements and microbeads are comprised of a one-pack retroreflective ink or a two-pack retroreflective ink having the coupling agent as the second pack.

66. (previously presented): The combination of claim 65 wherein the two-pack ink includes a reactive polyisocyanate or an alkoxysilyl alkyl derivative.

67. (previously presented): The combination of claim 57 wherein the microbeads are metallised with an aluminium coating that is superposed on stannous chloride.

68. (currently amended): The combination of claim 67 wherein the microbeads are treated with a compound selected from the group consisting of a silicate, a sodium ~~silicate~~ silicate, a silane, an amino silane, and a bis-[*gamma*-(trimethoxysilyl) propyl] amine ~~and stannous chloride~~.

69. (previously presented): The combination of claim 67 wherein the metallised microbeads are coated with a silicate or silane that is superposed on the metallised microbeads.

70. (previously presented): A composition that is a one-pack or a two-pack retroreflective ink which is comprised of the combination claimed in claim 57.

71. (previously presented): The combination of claim 70 wherein the retroreflective ink is water-based.

72. (previously presented): The combination of claim 71 that is suitably formulated for screen printing.

73. (currently amended): The combination ~~for~~ of claim 70 wherein the ink has a viscosity that is less than or equal to about 40 Pascal seconds at room temperature.

74. (withdrawn): A composition that is microbeads for use in the production of a retroreflective ink, the microbeads having applied thereto one or more of the group comprising silicate, a silane, an amino silane, bis-[*gamma*-(trimethoxysilyl) propyl] amine and stannous chloride.

75. (withdrawn): The composition of claim 74 wherein the microbeads are metallised with a coating of aluminium superposed on the stannous chloride.

76. (withdrawn): The composition of claim 75 wherein the silicate is superposed on the metallised aluminium coated beads and the silane is superposed on the silicate.

78. (withdrawn): The composition of claim 74 wherein the microbeads have one or more of the following characteristics selected from the group consisting of: a refractive index in the range of about 1.8 to 2.2, a median size of the microbeads in the range of about 10 to 100 microns and the microbeads are composed of titanium glass or barium glass.

79. (withdrawn): A composition that is a retroreflective ink which contains microbeads as claimed in claim 74.

80. (withdrawn): The composition of claim 78 which includes binder chemicals for attaching the microbeads to a substrate to which the ink is to be applied.

81. (withdrawn): The composition of claim 80 which includes a coupling agent ~~for coupling~~ for coupling the microbeads and for cross-linking the binder chemicals, the coupling agent being unreactive until the printing process is carried out.

82. (currently amended): A method for making a one-pack retroreflective ink comprising the steps of:

- (a) making microbeads;
- (b) suspending the microbeads in a liquid carrier medium, the liquid carrier medium is comprised of binder chemicals for attaching the microbeads to a substrate to which the ink is to be applied and a coupling agent which couples the microbeads and cross-links the binder chemicals, the one-pack retroreflective ink having a storage life of not less than about 3 months ~~and~~ the coupling agent being unreactive ~~except at elevated temperature at which the printed substrate is cured~~ and uncured until a curing step is carried out during which the temperature of the substrate and ink applied to the substrate is elevated to between 60 and 200 °C, the coupling agent having a storage life of not less than about 3 months and being unreactive except at elevated temperature of the curing step, the coupling agent being selected from the group consisting of an aminoalkyl silanetriol and a blocked polyisocyanate.

83. (previously presented): The method of claim 82 wherein step (a) includes applying an aluminium coating to the microbeads.

84. (previously presented): The method of claim 83 wherein step (a) includes pre-treating the microbeads with stannous chloride prior to application of the aluminium coating.

85. (previously presented): The method of claim 84 wherein step (a) includes treating the microbeads with a dilute aqueous solution of stannous chloride.

86. (previously presented): The method of claim 82 wherein step (a) includes hemispherically metallising the microbeads in a vacuum metallising process in which the microbeads are held on a film with an adhesive coating for transport through the metallising process, the adhesive coating is comprised of styrene-butadiene type adhesive.

87. (previously presented): The method according to claim 86 wherein step (a) includes passing the film through an aqueous solution of citric acid after metallisation..

88. (previously presented): The method of claim 86 wherein step (a) includes ultrasonically treating the film to assist in release of the microbeads from the adhesive.

89. (previously presented): The method of claim 85 wherein step (a) includes treating the microbeads prior to inclusion in the ink with a silicate.

90. (previously presented): The method of claim 82 wherein step (a) includes treating the microbeads with a silane or an amino silane prior to inclusion in the ink.

91. (previously presented): The method of claim 89 wherein step (a) includes treating the microbeads with a compound selected from the group consisting of a silane, an amino silane and bis-[*gamma*-(trimethoxysilyl) propyl] amine after the silicate treatment.

92. (previously presented): The method of claim 82 wherein step (a) includes adding an amino silanetriol or a blocked polyisocyanate to the liquid carrier medium as coupling agent.

93. (currently amended): The method of claim 82 wherein step (a) includes preparing the liquid carrier medium from the binder chemicals and the coupling agent before suspending the ~~microbeads~~ microbeads in the liquid carrier medium.

94. (previously presented): The method of claim 93 wherein the liquid carrier medium of step (b) includes additives selected from the group consisting of:

pigment, humectant, urea, urea and 2,3 propane diol, buffer, ammonium or sodium phosphate buffer, dispersant, defoamer, thickening agent, cross-linking agent, softening agent, carbon black, UV absorbing material, anti-scuffing agent, silicone, fluoropolymer, light spill-suppressing agent, anti-static agent and water repellent agent.

95. (previously presented): The method of claim 94 wherein step (b) includes adding a thickener to the liquid carrier medium before or after the addition of the binder chemicals and coupling agent.

96. (previously presented): A composition of an ink produced by the method of claim 82.

97. (previously presented): A composition of a substrate coated or printed with a composition of claim 96.

98. (previously presented): The composition of claim 97 wherein the substrate is a screen for displaying projected images or a studio background for chroma-keying applications.

99. (previously presented): The composition of claim 97 wherein the substrate is a flexible tape.

100. (previously presented): The method of providing a substrate having a retroreflective coating, comprising the steps of:

applying to the substrate an ink as claimed in claim 96 wherein the ink is formulated as a one-pack retroreflective ink and the coupling agent is activated after the ink is printed or coated on to the substrate.

101. (previously presented): The method of claim 100 wherein the coupling agent is activated by curing the ink coating at elevated temperature.



102. (previously presented): The method of claim 100 wherein the coupling agent is activated by UV light or other high energy radiation during or after the printing process.

103. (currently amended): The composition of claim 96 wherein the ink ~~that~~ is a retroreflective one-pack ink having a storage life of not less than about 3 months.

104. (currently amended): The composition of claim 103 wherein the retroreflective one-pack ink has a viscosity of between about 10 and 30 Pascal seconds after storage of not less than about 3 months.

105. (currently amended): The composition of claim 103 wherein the retroreflective one-pack ink applied to the substrate and cured has a laundering durability such that the retroreflectivity is not reduced by more than about 40% when ~~applied to a~~ the substrate is in the form of a cotton, nylon or polyester fabric and laundered for 5 cycles in accordance with ISO 6330, method 5A.

106. (withdrawn): A composition of a fabric having fireproof or fire retardant properties that is printed or coated with a retroreflective ink which is comprised of retroreflective elements in a polymeric matrix, the fabric comprising a structural component that chars before it melts.

107. (withdrawn): The composition of claim 106 wherein the fabric is made fireproof or fire retardant by application of a fire retardant agent.

108. (withdrawn): The composition of claim 107 wherein the fire retardant agent is applied to a cellulosic, the fire retardant agent is selected from the group consisting of Proban ® RTM and Pyrovatex ® RTM.

109. (withdrawn): The composition of claim 106 wherein the fabric is comprised of an aramid fiber.

110. (withdrawn): The composition of claim 106 wherein the fabric is non-burning after a retroreflective ink has been applied to the fabric.

111. (withdrawn): The composition of claim 110 wherein the ink is aqueous-based and the polymeric matrix comprises polyvinylidene chloride.

112. (withdrawn): The composition of claim 110 wherein the polymeric matrix comprises polyvinyl chloride or other non-flammable plastisol.

113. (withdrawn): A composition that is a fireproof or fire retardant fabric printed or coated with a retroreflective ink which is comprised of retroreflective elements in a polymeric matrix, the fabric is comprised of a structural component that chars before it melts, the ink is comprised of an ink as claimed in claim 70.